

This is the number given on the tables of atomic weight issued by the German Chemical Society. Hinrichsen's method consists in the conversion of extremely pure Iceland spar into oxide of calcium. The only measurable impurity present in the spar was iron, the amount of which expressed as ferric oxide was '032 per cent. The conversion into oxide was effected in specially constructed platinum crucibles, the latter being heated in an electric oven at a temperature of 1200–1400° C. Four determinations of the atomic weight gave respectively 40'144, 40'141, 40'142 and 40'141—mean = 40'142. This number deviates considerably from that which up to the present time has been generally accepted.

In a paper on the fossil shells of the Colorado desert, published in a recent issue (No. 1256) of the *Proceedings* of the U.S. Museum, Dr. R. E. C. Stearns gives an interesting account of the formation of the desert itself. Surrounded by mountains except in the south, where it opens out, the Colorado desert of California was evidently once an extension of the Californian Gulf, which must once have reached inland some two hundred miles further than at present. The separation of the upper end of this old gulf, now forming the desert, has been caused by the sediment brought down on the east side by the Colorado river, which gradually silted up this portion of the gulf till the present desert area was isolated. Throughout the desert are to be found thousands of small fresh-water sub-fossil shells, mostly referable to the genera *Paludestrina* and *Physa*, which appear to have been transported partly by whirlwinds, but chiefly by birds. Some of the species of these molluscs are still living in certain localities in the desert. The remarkable variation exhibited by the shells of certain species is described in detail.

THE additions to the Zoological Society's Gardens during the past week include a Green Monkey (*Cercopithecus callitrichus*) from West Africa, presented by Mr. F. S. Davidson; a Verreaux's Guinea-fowl (*Guttera edouardi*), a West African Python (*Python sebae*, var. *natalensis*) from Natal, presented by Mr. W. Champion; a Hudson Bay Squirrel (*Sciurus hudsonius*) from the Rocky Mountains, presented by Mr. Edward Whymper; a Lesser Sulphur-crested Cockatoo (*Cacatua sulphurea*) from Moluccas, deposited.

### OUR ASTRONOMICAL COLUMN.

**DIMENSIONS OF THE PLANETS AND SATELLITES.**—In the *Astronomische Nachrichten* (Bd. 157, No. 3760), Prof. E. E. Barnard presents a series of revised reductions of measures made at the Lick Observatory in 1894 and 1895, together with recent determinations with the 40-inch refractor at the Yerkes Observatory.

**Mercury.**—The measures of diameter were made in the daytime, when the disc of the planet was little brighter than the sky background. Powers of 230, 460 and 700 diameters were used, and a piece of amber-coloured glass was placed as a screen over the eye-piece. The resulting mean value of the diameter was 2965 miles. During the observations the disc of the planet was carefully examined for the linear canal system described by other workers, but no such markings were seen. Under excellent conditions (especially on August 31, 1900), however, decided details in the form of three or four large darkish spots were readily distinguished, and were comparable to the markings on the moon as seen with the unaided eye.

**Venus.**—Measures were made of this planet specially to determine the extent of variation due to irradiation; night and day measures were both made with the full aperture of 40 inches, but the amber screen was used for the day series. The value obtained for the irradiation was 0"25. The day diameter of the planet is given as 7713 miles. A series of dusky markings were the only features observed on the disc, similar to but fainter than those on Mercury.

**Minor Planets.**—Measures of the albedos and diameters of

the four chief asteroids were obtained, with the following results:—

	Albedo.		Diameter.
	Mars = 1.		
Ceres ...	0'67	...	477 miles.
Pallas ...	0'88	...	304 "
Juno ...	1'67	...	120 "
Vesta ...	2'77	...	239 "

As seen in the 36-inch and 40-inch telescopes the discs of such asteroids as are measurable always appear well defined and round, with no traces of markings on their surfaces. The corrected values for the other planets are as under:—

		Diameter.
Mars (Equatorial) ...	...	4352 miles.
" (Polar) ...	...	4312 "
Jupiter (Equatorial) ...	...	90,190 "
" (Polar) ...	...	84,570 "
" Satellite I. ...	...	2452 "
" " II. ...	...	2045 "
" " III. ...	...	3558 "
" " IV. ...	...	3345 "
Saturn (Equatorial) ...	...	76,470 "
" (Polar) ...	...	69,780 "
" Satellite Titan... ..	...	2720 "
Uranus (Equatorial) ...	...	35,820 "
" (Polar) ...	...	33,921 "
Neptune ...	...	32,900 "

No markings were observed on Neptune, and its disc always appeared round.

**HARVARD COLLEGE OBSERVATORY REPORT, 1901.**—In his report for the year ending September 30, 1901, Prof. E. C. Pickering first mentions that of the three important astronomical events of the year, the Harvard College Observatory staff only participated in the determination of the light variation of Eros and the complete investigation of the changes of Nova Persei. The reason why no measures of Eros for parallax were made was that some fifty other institutions were cooperating in the work, rendering observations at Harvard unnecessary; in the case of the total eclipse in Sumatra the conditions were not considered sufficiently favourable to justify any large expenditure.

**East Equatorial.**—This instrument has been employed, as in former years, for photometric light comparisons with the achromatic prism polarising photometer; more than 16,000 settings have been made, including 1224 measures of the magnitude of Nova Persei. For double stars, &c., too close for examination with the above instrument, a second photometer has been adapted, and 2278 settings made with it. Other work with this equatorial has been the photometric measurement of Jupiter's satellites while undergoing eclipse, the light variations of the minor planet Eros and the asteroids Vesta and Tercidina, comparisons of long-period variables, and the selection and measurement of twelfth-magnitude standards.

**West Equatorial.**—This has been employed for similar photometric work on variables and comparison stars.

**Meridian Circle.**—Work with this instrument has chiefly consisted of zone observations to compare results obtained by use of crossed spider threads or ruled glass plates. The conclusions have been published in *Annals*, vol. xli. No. 7.

**12-inch Meridian Photometer.**—With this instrument 54,448 settings have been made by the director on 126 nights. A catalogue of 9233 Durchmusterung stars has been completed, and the planet Eros observed on 56 nights.

**Meridian Photometer.**—33,316 settings have been made on 98 nights, the principal work being the observation of a catalogue of 376 standard stars of the fifth magnitude; also comparison stars for Eros and other similar objects.

**Henry Draper Memorial.**—With the 11-inch Draper telescope 673 photographs have been obtained, and with the 8-inch instrument 1766 photographs. The total number of photographs taken during the year was 4081. Two new variables, three stars with peculiar spectra, and the presence of bright hydrogen lines in the spectrum of U Andromedæ, have been detected. Photographs of the spectrum of lightning were obtained with the Draper telescope with objective prism during the summer.

Respecting the production of stellar spectra two new devices are announced. For photographing the spectra of stars near the horizon, below 10° altitude, the plan has been adopted of turning the objective prism by a computed amount so as to correct for the atmospheric refraction in declination. The stellar

spectra have been shaded automatically during the process of reproduction so as to equalise the intensity throughout.

As systematic work the 8-inch telescope covers all parts of the sky north of declination  $-12^{\circ}5'$  from two to four times a year; the Cooke lens covers all parts available two or more times a month, and the transit photometer records all stars visible to the naked eye crossing the meridian every clear night.

**Arequipa Station.**—The 13-inch Boyden telescope has been used for photographing clusters containing probable variable stars. With this instrument 140 plates have been obtained; 2269 with the 8-inch Bache telescope and 919 with the 24-inch Bruce lens. From the examination of these latter plates 298 new nebulae have been found, of which 9 are spiral and 3 ring nebulae.

The long focus telescope is now back from Jamaica, where a long series of photographs of the lunar surface has been obtained under five different illuminations. These will furnish material for a photographic atlas. The diameter of the moon's image is about fifteen inches.

**Blue Hill Meteorological Station.**—Continued experiments are being made in the exploration of the upper atmosphere by means of kites, altitudes up to 12,550 feet having been obtained. Considerable success has attended the endeavour to fly the kites from ocean-going vessels in order to record weather conditions away from land surfaces.

**TOTAL ECLIPSE OF THE SUN, MAY 18, 1901.**—In *Popular Astronomy* (vol. x. pp. 1-4, January), Prof. A. N. Skinner gives an account of the expedition to Sumatra from the United States Naval Observatory. Three stations were selected, at two of which the weather conditions were unfavourable. At the third, Fort de Koch, excellent photographs of the corona and the chromospheric spectrum were obtained. The former were taken with a lens of 5 inches aperture and 39 feet focal length; two of these are reproduced with the article; the spectroscopic equipment consisted of a 30-foot concave grating spectrograph, with which six photographs were obtained.

### A MAGAZINE OF SCIENCE AND PHILOSOPHY.<sup>1</sup>

"ANOTHER new magazine!" But the editor, in anticipating this exclamation, suggests that it is no more reasonable than would be "Another new flower in the fields!" or "Another new tree in the wood!" Still, one is not obliged to pluck the flower or to cut down the tree; but a new magazine makes a certain claim on the attention of the public, especially as it is addressed to the scientific public as well as to philosophers in the stricter sense of the word. Indeed, it is an attempt to induce men of science to interest themselves more in philosophy and students of philosophy to pay more attention to modern science. It is not intended to serve as a means of popularising either of these regions of thought, and the editor promises to exclude all purely speculative matter for which an experimental basis is wanting.

The first number contains an interesting article by Mach on "Similarity and Analogy as an aid to Investigation," in which Huygens, Faraday, Maxwell and Kelvin are held up as examples of investigators who have made sound use of analogy and have contributed, in consequence, greatly to the progress of human knowledge. Wald contributes "Critical Studies on the most important Fundamental Conceptions of Chemistry." It must be confessed that this introduction (for more is promised hereafter) is not very intelligible. "The Principle of Continuity in the Mathematical Treatment of Natural Phenomena" is the title of an article by Anton Scheyer. The first chapter considers the principle as illustrated in the calculus; the second deals with the principle of continuity in natural science; the third, in mechanics; the fourth, in electrical and thermal phenomena; in the fifth the kinetic theory of gases is discussed; and the sixth chapter treats of the hypothesis of matter and of energetics. Here objections are raised to Ostwald's conclusion that "Our senses tell us of differences in energy between them and their surroundings"; for it is remarked that if equal quantities of energy be imparted to two bodies of equal mass yet of different specific heat, having the same initial temperature, while the final temperature of each will be the same, heat will

<sup>1</sup> *Annalen der Naturphilosophie*. Edited by Wilhelm Ostwald. (Veit and Co.). Price 14 Marks, yearly.

have passed from the one of lower to the one of higher specific heat; and yet each will affect the sense of temperature equally, though they have gained different amounts of energy. He insists, therefore, that besides energy there must exist some other magnitude which must not only be capable of mathematical treatment, but must be as necessary for the true description of occurrences as energy itself. He also questions whether the doctrine of energy suffices to describe such a stationary condition as two equal light-rays polarised at right-angles to each other, or to picture the stationary state which exists when energy flows in a field of permanent magnets and charged conductors, according to Poynting's law. For these and other reasons he regards it as probable that an interpretation of the universe will be more complicated than would be the case were Ostwald's energetic conception possible.

Ostwald contributes a critical article on Kant's "Metaphysical Basis of Science." To Kant's statement that true science must treat its subject-matter according to *a priori* principles, and that only science falsely so-called deals with laws deduced from experiment, Ostwald replies by denying the possibility of *a priori* conclusions, and maintains that all knowledge is derived from experience. Another celebrated dictum of Kant's is that in any investigation of Nature only so much real science is present as is expressible in mathematical terms; Ostwald insists, however, that mathematics is only a language in which the results of experiments may be conveniently expressed, and that it can contain nothing more in its conclusions than what experiment lends to its premisses. And while Kant, although acknowledging that in principle his scientific treatise has a close connection with the ordinary province of metaphysics, to wit, God, Freedom and Immortality, distinguished them sharply, regarding the former "as a shoot from the same root as the latter, but one which hinders its regular growth," Ostwald maintains that no stronger argument can be found for the necessity of a purely experimental basis for all branches of knowledge.

A somewhat technical article by Arthur von Oettingen on "The Dual System of Harmony," and one by E. Sievers on "Melody of Voice in (Reciting) German Poetry," are followed by reviews of new books by the editor. Among these it is somewhat amusing to find Judge Stallo's "Concepts of Physics," which has only now reached the German public, through its translator, H. Kleinpeter. W. R.

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

**CAMBRIDGE.**—Mr. T. H. Middleton, professor of agriculture in the Durham College of Science, Newcastle-on-Tyne, has been elected to the chair recently vacated by Dr. Somerville.

Dr. Barclay-Smith has been reappointed senior demonstrator of anatomy.

The Vice-Chancellor, Prof. J. J. Thomson, and Mr. R. T. Wright will represent the University at the jubilee of Owens College, Manchester, to be celebrated next March.

EDUCATION was given first place in the King's speech to the Commons at the opening of Parliament last Thursday. The words used were "Proposals for the Co-ordination and improvement of Primary and Secondary Education will be laid before you." It is to be hoped that a comprehensive measure will be introduced early in the session, and that nothing will be permitted to interfere with the settlement of the questions involved in it.

THE adoption of the metric system of weights and measures would be so much to the advantage of the work of education and commerce in this country that efforts should be made to bring the subject forward on every suitable occasion. We are, therefore, glad to see that the following resolution was passed at a general meeting of Convocation of the University of London on Monday:—"That this House is of opinion that, in the interests of commerce, science and education, legislation should be promptly undertaken to make compulsory in this kingdom, after a proper interval, the use of the metric system of weights and measures for all purposes."

PROF. ALFRED LODGE stated the case for reform in methods of teaching geometry at the annual meeting of the Mathematical Association held on Saturday last. He urged that a new text-book of geometry, framed more or less on the model